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Visualising the unknown knowns in archaeology: why prehistory must not always look the same

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„… because as we know, there are known knowns; there are things that we know that we know.
We also know there are known unknowns; that is to say we know there are some things we do not know.
But there are also unknown unknowns, the ones we don't know we don't know."
Donald Rumsfeld, US Secretary of Defence, February 2002

Abstract
The act of reconstructing something from very fragmentary traces requires us to depict unknown knowns, things that we know existed, but of which we have no actual knowledge. We know that a posthole did once contain a post, but whether that post – at least above ground – was round or square, plain or highly decorated, or how high it was, is something we do not know. At best, we can make rough estimates, but usually those have a wide margin of error. In visualising that uncertainty, applying Occam's razor – usually a sound scientific principle – is the worst possible choice: if always using the minimal assumptions necessary to reconstruct houses from posts, the outcome will necessarily be the same minimalistic result. And since a picture says more than a thousand words, we will impress a fundamentally false picture of the past on everyone's mind: on that of the public; but also on our own, who are equally influenced by the illustrations we see in each other's work.

Thus, in this paper, I will argue that for making our reconstructions more reliable depictions of the past – not in terms of the details we show on each individual one, but in terms of the overall picture of the past we convey through reconstructions in general – we need to be radically creative. We need to produce, not just the reconstruction of how the object of our attempt most likely looked, but several reconstructions which show the range (the 'standard deviation') of conceivable possibilities of how it might have looked like – even if, for this purpose, we have to make maximal assumptions.

Zusammenfassung

Die Rekonstruktion fragmentarisch erhaltener Dinge macht es erforderlich, bekannte Unbekannte darzustellen; Dinge von deren Existenz wir zwar wissen, aber von denen wir dennoch keine genaue Kenntnis haben. Wir wissen zwar, dass ein Pfostenloch dereinst einen Pfosten enthalten hat, aber ob dieser Pfosten – wenigstens über der Erdoberfläche – rund oder rechteckig, unverziert oder verziert oder wie hoch er genau war, ist etwas, wovon wir nichts wissen. Im besten Fall können wir mit groben Schätzwerten operieren, aber diese lassen einen breiten Raum für Abweichungen. Bei der Darstellung dieser Unsicherheit ist die Anwendung von Occam's Rasiermesser – gewöhnlich ein solides Prinzip der Wissenschaft – die schlechteste mögliche Lösung: legt man allen Rekonstruktionen, die z. B. aus Pfostenlöchern Häuser machen sollen, stets die wenigsten Annahmen zu Grunde, wird das Ergebnis stets gleichermaßen minimalistische Rekonstruktionen sein. Und nachdem ein Bild mehr sagt als 1000 Worte erwecken wir bei allen Betrachtern einen falschen Eindruck über die Vergangenheit: sowohl bei der Öffentlichkeit als auch bei uns selbst, die wir alle gleichermaßen durch Bilder, die wir in der Arbeit anderer sehen, beeinflusst werden.

Daher argumentiere ich in diesem Beitrag dass wir, um unsere Rekonstruktionen insgesamt verlässlicher zu machen – nicht unbedingt in Bezug auf die gezeigten Details in jedem konkreten Einzelfall, sondern im Gesamtbild, das wir durch unsere gesammelten Rekonstruktionsversuche erzeugen – radikal kreativ sein müssen. Statt stets nur die eine, uns selbst am wahrscheinlichsten erscheinende, minimalistische Rekonstruktion eines konkreten Befundes zu zeigen, sollten wir jeweils mehrere Rekonstruktionsversuche anstellen, die das Spektrum (die „Standardabweichung") der vorstellbaren Rekonstruktionsmöglichkeiten zeigen – selbst wenn wir dafür Maximalannahmen treffen müssen.

In a rather famous and much derided, but nonetheless quite perceptive statement, Donald Rumsfeld, then US Secretary of Defence, talked about three categories of known and unknown things: things that we know that we know, his known knowns, things we know we do not know, the known unknowns, and things we don't even know we don't know, the unknown unknowns. In archaeological reconstructions, we often deal with a fourth category of things that Rumsfeld missed in his statement, the unknown knowns: things we know that they existed, but which, of themselves, are mostly unknown to us. For instance, we know that a posthole will at some time have contained a post, but of that post itself we usually have very little knowledge: it is unknown to us how much it rose above ground, whether it was (at least above ground) round or square, or whether it was plain or highly decorated. Yet in reconstructions, it is exactly these unknown knowns about which we need to make visual statements: they, after all, are what makes up the gaps that need to be filled to be able to create a meaningful picture.

The very point of studying archaeology is to explain, by means of examining the fragmentary remains that survive and other evidence, those aspects of the past which have not survived; at least if we want to understand archaeology as a scholarly endeavour and not just plain collecting. Whether in words (for thoughts on verbal reconstruction see Leskovar 2005) or images (see for a first stab at this Karl 1999), visualising archaeology by reconstructive interpretation aims at creating a 'complete' image from fragmentary records to increase scholarly and public understanding of the past. This 'filling of the gaps' is, ultimately, a process of creatively imagining the 'whole', of 'making it up' by putting into the image things we know were there without knowing exactly how they originally looked like. Ideally, what we fill into these gaps should be based on solid research, careful consideration of what could have been there, and how it probably looked like. But in practice, as often as not, we are required to make up these gap-fillers as we go along.

This requirement to – quite frequently – make it up as

we go along is due to the fact that the main problem we face in reconstructing the past is that – in difference to the *pars pro toto* burial good placed in somebody's tomb by some prehistoric burial community which most probably referred to a 'whole' well-known to that community – the 'whole' that we are trying to show is unknown to us. Thus, visualising it is riddled with uncertainties like the ones described above for the post in the posthole: we do not know whether the post to fit the hole in our image is round or square, and many a times, there is no way of deciding either way, because there is no evidence at all that makes the one choice more likely than the other.

In a verbal description, we can say as much: the post, above ground, may have been round or square, and we have no means to decide which way it actually was. In an image, however, showing this uncertainty is much more problematic: if we draw an image of the post, we have to make a decision to show it either as a round or as a square post, since both is not possible in the same image.

But images not only can, but usually do say more than a thousand words: think of the reconstruction of a house from a more or less arbitrarily chosen selection of postholes on an archaeological site. Such an image normally does not only show the posts and whether they are square or round, but also the walls between them, the roof above them, and a myriad of other aspects that cannot be deduced from the postholes and any finds made in or between them alone. Thus, each visual (or indeed physical) reconstruction on its own is quite powerful already: the unsuspecting beholder, whether layman or expert, with but a simple glance, gets a whole lot of information about a house that would take him quite some time to read up upon. And since it is visual, he is much more likely to remember it, and much more likely to internalise it than a longwinded description that does not actually come down on either side of the 'round or square peg' question. The visual statement is unequivocal, does not allow for ambiguities and is not suited to show uncertainty, and thus gives a straight answer to an equally straight question: What do these random-looking splotches on a site plan mean? Well, they are what is left of a house, and the house looked like that shown on the reconstruction image.

A visual reconstruction thus provides a definitive answer to the question of 'how the past actually was', and definitive answers are what most of its beholders – including most professional archaeologists – are actually looking for, at least subconsciously. While we as professionals may consciously be fully aware that whatever statement any one of us makes about the past is just the statement's author's (probably best) guess of 'how the past could have been', the more certain the statement appears to be, the more likely it is that we are going to take it at face value. Thus, visual reconstructions are particularly effective in shaping our perception of the past.

Accuracy vs. reliability of statements

Any statement – whether verbal or visual – about particular values of anything ideally has two essential properties: it ideally is both accurate and reliable. This is particularly true if the statement is not just any ordinary statement, but a scholarly statement: after all, scholarship aims to find 'the truth' about what it studies, or at least an approximation as close to 'the truth' as we can get[1]. In a reconstruction image, the properties of a post – whether it is square or round, plain or decorated, etc., are such values and thus ideally should also have the properties of being both accurate and reliable.

Yet, where statements about uncertain values are concerned, the properties of accuracy and reliability do not necessarily match each other, but more often tend to be mutually exclusive. Let us first take a short look at what each of these two properties describe:

The accuracy of a statement (e.g. a measurement) about something (e.g. a quantity) is the degree of closeness to its actual (= true) nature (e.g. its value). The closer the statement about the value of it is to its actual value, the more accurate the statement is.

To provide a short example, an accurate statement about the number of apples in the bowl in figure 1 would be

1 This is even the case in epistemologies that allow for the possibility that there is no 'truth' as such, but only 'useful knowledge', as is the case in most constructivist epistemologies: 'useful' knowledge is, then, usually defined as such that does provide solutions to problems that actually work in reality. Naturally, to be considered as actually useful, the knowledge produced must not just work in individual instances, but in all or at least most instances where the same problem is encountered, and for doing that, the knowledge must both be accurate and reliable.

Fig. 1: A bowl of apples.

'This bowl contains 6 apples'. Of course, only 5 apples are actually visible in the image, but we can reasonably assume from the arrangement of the visible apples in the bowl that there actually is a sixth apple in it, which is just, due to the perspective of the shot, hidden behind the other apples. Thus, the accurate statement about the actual number of apples in the bowl is not that it contains 5, but that it contains 6 apples, because 6 apples is the most likely actual value of the number of apples in that bowl.

Yet, we cannot be absolutely sure about this, but rather, the actual number of apples in the bowl is uncertain. This is where the reliability of a statement comes in.

In difference to the accuracy of a statement, a statement about something (e.g. a quantity) is reliable if it (most likely) includes the actual (true) nature of that something (e.g. its value). Where a statement about something uncertain is concerned, a reliable statement thus is usually at least somewhat inaccurate, since it needs to capture the whole range of possible values, rather than just being as close as possible to the actual value.

Where our example in figure 1 is concerned, the reliable statement about the quantity of apples in the bowl would be 'This bowl contains between 5 and 7 (or 6 +/- 1) apples'. This is for the reason that the image shows that there are at least 5 apples in the bowl, because that is the number of apples we can count on the image. However, due to the perspective of the shot, there is a distinct possibility that at least one, possibly even two apples may be hidden behind the visible apples (although if it were 2, they would probably have to be somewhat smaller than the quite evenly-sized apples visible on the image – but the possibility for this being the case cannot be excluded with certainty). Thus, to make a statement that includes the actual value of apples in that bowl, we need to express the minimum and maximum amount possible by giving a confidence interval: we are uncertain about the precise number, but are (reasonably) certain (= confident) that the actual number of apples in the bowl is between the minimum and maximum values expressed in the statement.

In terms of our problem, accurate statements create an impression of certainty: they aim to be as precise as possible, and precision requires certainty about the actual value(s) of properties of the object of the statement. Reliable statements, on the other hand, clearly show the degree of uncertainty about the actual value(s) of properties of the object of the statement. The requirement of visual reconstructions to be decisive about every value of every (unknown known) property of the object of the reconstruction thus naturally lends itself to the creation of visual statements that will be perceived as accurate; though – given that we have to be decisive regarding the value of each individual property of the object that is to be depicted – they are unlikely to be reliable. And that, in my opinion, is a problem, particularly if reconstructive visualisations are not seen individually on a case by case basis, but on the whole as in sum creating a particularly decisive picture of the past.

Occam's Razor reconstructions

William of Ockham (c. 1287–1347 AD) was an English Franciscan Friar and one of the foremost medieval thinkers. His principle of parsimony in explanation and theory building, which has become known as Occam's Razor, effectively argues that when constructing any kind of explanation or theory (that is, any scholarly statement), one should make no more assumptions than absolutely necessary. This since has also been interpreted that if one is to make a scholarly selection between different, competing scholarly statements, the one which requires the fewest assumptions should be selected.

This principle – which is considered to, at least usually, be a sound and useful scholarly principle – normally tends to guide our thinking when creating visual reconstructions of archaeological objects: we like to use the least amount of absolutely necessary assumptions to arrive at what we then frequently perceive to be a 'reasona-

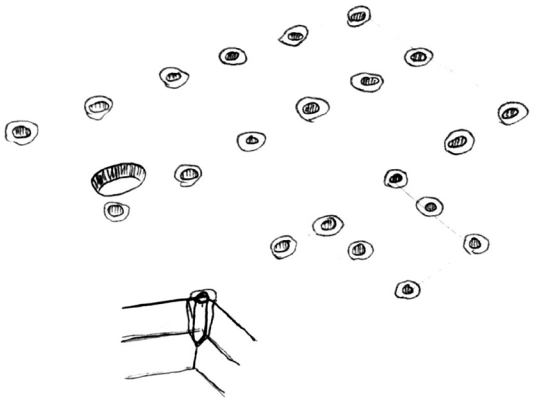

Fig. 2: A more or less random arrangement of postholes (sketch based on a real find at Göttlesbrunn. Lower Austria; Karl, Prochaska 2005, 325).

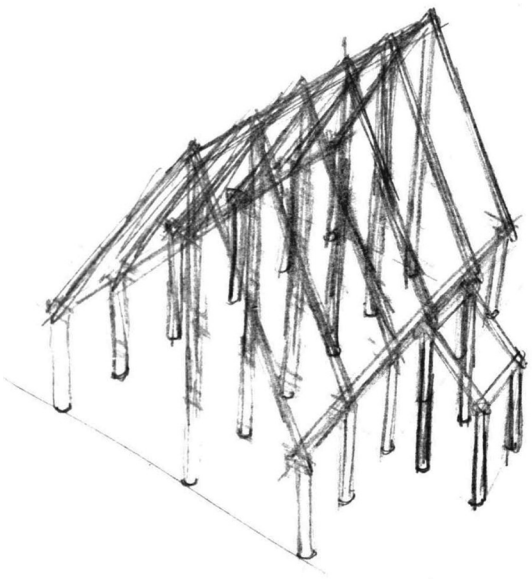

Fig. 3: The posts from fig. 2 sketched up to provide a basic framework for two rectangular buildings adjacent to each other.

bly' accurate approximation of what our object of interest would have (actually) looked like. At any rate, we tend to be very concerned about getting those bits right for which we have evidence, that is, the known knowns of Donald Rumsfeld. After all, we know these things were there, and they looked exactly the way they are being shown, so that bit of the image created is certainly accurate. For everything else, however, we tend to go with the minimal assumptions: if there is a posthole, there must have been a post, but that post is shown (most often) as a simple, round and plain tree trunk without any hint at having been transformed by human action. After all, showing it as a round 'quasi-natural' post requires only the assumption that a tree has been felled and cut to the right length, while showing it as a square post adds to this the assumption that it was not only felled and cut, but also worked into square shape. Thus, Occam's Razor is applied and we stick with the simple round shape, at least as long as we do not have any evidence (e.g. the actual posthole in the post-pit or surviving remains of the post itself are clearly square in shape) to the contrary. Similarly, if we have a rectangular alignment of postholes, we connect the gaps between the posts with some walling, with a door in one of those walls, and put as simple a roof on it as is possible, because, again, all these are the minimal assumptions necessary to show the post alignment 'accurately' as what it most likely was, a rectangular building. What we do not put into our reconstruction, however, are windows, an upper floor, internal dividing walls creating several separated rooms, or anything else that would require us to make additional assumptions about how the building might have looked like.

This process creates – usually – just one single image of the reconstructed, the one we are feeling 'confident' with, since we stuck as closely as possible to the attested evidence and added nothing that was not absolutely necessary: we didn't make anything up that we had no evidence for, but only showed what we were certain about. To give an example, in the case of a more or less random arrangement of posts (fig. 2), we find those posts that seem to reasonably align into rectangular arrangements and connect all posts in each rectangle to provide a framework for two simple buildings adjacent to each other (fig. 3). We then draw each of them using the minimal assumptions necessary and thus turn them into the definitive reconstruction of the two buildings that probably would have stood on the site in the Iron Age (fig. 4).

And with that, we consider our job done, and done well, since we haven't made up anything that we didn't absolutely have to make up to make buildings out of the surviving postholes. We have shown nothing but what we know for certain – that there were posts there – and what is necessary to provide the beholder with an image that is actually meaningful, that shows our interpretation

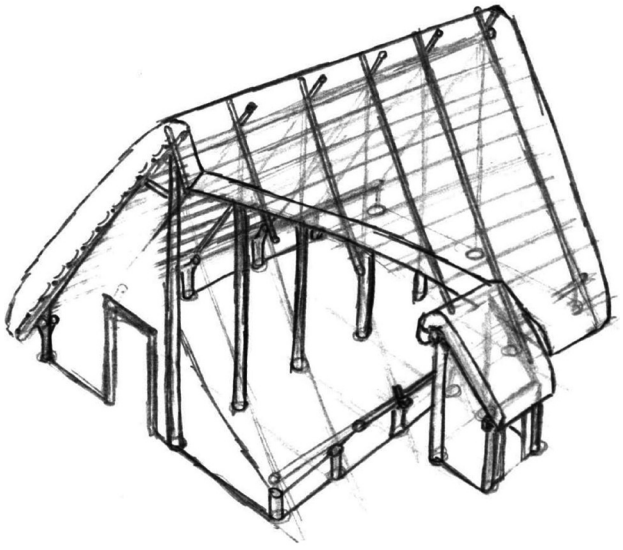

Fig. 4: A reconstruction sketch of the two buildings from fig. 2 using the minimal assumptions necessary to show them as a larger and smaller building adjacent to each other.

of rectangular post alignments as buildings. But what we have not shown at all is any uncertainty, anything we admit we do not know even though we know it must have been there in some way, shape or form. We have created an impression of accuracy where in fact, what we should have aimed for is a reliable visualisation: after all, the building or buildings on the site may well not have looked anything like what is shown on this reconstruction drawing (fig. 4) at all, but may have looked quite different. But that possibility that it may very well have looked very different is something we neglected to show: we provided a definitive image only, and that is how the average beholder will from now on imagine the buildings on site will have looked like, for certain.

Wrong impressions of accuracy

Visual reconstructions create impressions, that much is beyond doubt. And if we follow the above process of using Occam's Razor, using the minimum assumptions necessary to arrive at an explanatory (visual) statement and produce just one picture per object to be reconstructed, we in each individual case create an impression of accuracy and thus of certainty (and the more of the actual evidence that has survived we include in the image, ideally with the originals being displayed side by side with the reconstruction, the greater the impression of certainty is that we create: after all, if we take such great care to get every individual detail showing evidence that has survived absolutely right in our reconstruction, who in their right mind would assume that other parts of the reconstruction that are shown in the same way are any less accurate and certain?). After all, the average beholder, but even the scholarly beholder, will assume that if that and not another reconstruction was created, there must be a good reason for this and not another reconstruction being shown: after all, the reconstruction is a part of scholarly work and thus supposed to be based on sound reasoning. So if it is this image, rather than another, that is being shown, and shown as the definitive image of the object reconstructed, the reconstruction must be reasonably accurate and the scholar who created it reasonably certain about it. Why else show it, after all? This already creates a problem in each individual case: the actual uncertainty about many elements of the reconstruction disappears entirely for the beholder, and a wrong sense of accuracy and certainty replaces any potential awareness of the uncertainty contained in the image that the beholder might consciously have had even where this individual case is concerned.

But matters are even worse if one considers the bigger picture of how all individual reconstructions will influence the beholders perception of the past if not seen independently of each other, but in conjunction. And most beholders will not just see a single reconstruction and consider that single image in isolation from all other such images that also exist, but – at least over the course of many years or even over the course of an entire academic career – will see many such reconstructions. Of course, each reconstruction they see will be different in some regards from most others, because many will be based on different original features and thus will look somewhat differently. However, if all, or even only a sizeable number of these images was ultimately created using the same minimalistic principle that underlies Occam's Razor, they will all look roughly the same, that is, will appear similarly minimalistic. And since each and every single one of them will be perceived by the beholder as an 'independently arrived at', probably 'accurate' result of a scholarly process of making reasoned decision, the repetitive similarity provides positive feedback regarding the certainty of each independent reconstruction as well as the overall picture that the beholder creates in his mind of the object of reconstruction:

in scholarly terms, each similarly looking reconstruction will be perceived as an independent confirmation of the certainty of each individual reconstruction. The overall result, thus, is a massively increased perception of the level of accuracy or certainty that the past, on average, looked like all these reconstructions that confirm each other; and thus of an increased perception of that the past will actually accurately have been absolutely minimalistic. In our case of the Iron Age houses, all Iron Age houses will increasingly be perceived as primitive, minimalistic shelters that all looked pretty much the same.

If seen in conjunction, similarly minimalistic reconstructions, which are similarly minimalistic because the same minimalistic problem-solving principle has been applied in the decision-making process that led to their creation, works like Pavlovian conditioning: much like the dog whose saliva starts to run if he hears a bell which in the past regularly announced that he would get some food, our perception of how the past looked like is conditioned towards a very specific result, a result which in turn will inform how we depict the same object in future reconstruction drawings. The result is a self-fulfilling prophecy, that of a uniform picture of the past. Yet, if there is one thing we can be and are reasonably certain about, it is that 'the past' was anything but uniform: all our evidence, for instance in the Iron Age archaeological record, seems to confirm that regional, social, economic and other differences appear frequently in the record and frequently even seem to have been clearly and consciously expressed. There was not one uniform European Iron Age, but many different European Iron Ages.

Thus, creating reconstruction images that – due to the very method by which they were created, and exclusively for the reason of that method being applied – create an impression that the Iron Age was uniform after all, clearly creates a fundamentally flawed and horribly wrong picture. It is exactly the opposite of what we are trying to show to the beholders of our work, and it is almost comical that the means we use for the purpose of making our results more palatable to our beholders creates the very opposite message than we are trying to get across. By creating reconstructions the way we always have done and still mostly do, we are creating a certainty and a wrong sense of accuracy that more effectively counteracts the point we are trying to get across than anything any of us could ever say about the Iron Age.

Thus, I would argue that, for getting our message heard (or seen) and understood, we must move away from methods of reconstruction (whether verbal or visual) that create false impressions of the accuracy and certainty of our results where there is none. Instead of trying to create accurate reconstructions, what we must aim for is to create reliable reconstructions; reconstructions that clearly show uncertainty where it exists.

For achieving this aim of producing reliable rather than accurate reconstructions, I would argue that we need to proceed very differently than we have in the past: rather than showing one (minimalistic) definitive image of whatever we try to reconstruct and aiming for a maximum of certainty while avoiding like the devil any assumptions that are not entirely necessary; I would suggest we proceed like scientists by providing not just a single reconstruction of the object we are trying to reconstruct, but rather produce several different reconstructions, one using minimal, some using a few, and others using maximum assumptions, to show the confidence interval for each set of reconstructions, the degree of uncertainty contained in the reconstructive process.

The confidence interval

So what is the confidence we have to reckon with in pre-modern wooden architecture, to stick with the example of house reconstructions? There is, in fact, plenty that is possible to build in wood with pre-modern tools and technology, and there is no reason to believe that Iron Age carpenters were unable to match, at least in some cases, the crafting skills required for building some of the finer examples of wooden architecture that still survives in either models or indeed, in case of medieval buildings, in original until today. To provide a few images one can easily grab from the Internet, there are, for instance, clay models from Han Dynasty watchtowers, now held in Metropolitan Museum of Art in New York (fig. 5) that clearly show that the ancient Chinese were able to build quite elaborate, multi-storeyed, elaborately decorated wooden structures in the 1st and 2nd centuries AD. Similarly, Heddal Stave Church (fig. 6), the largest such church in Norway, which dates from the early 13th century AD, is anything but a simple, plain and minimalistic construction. Similarly elaborate wooden buildings from the medieval and early modern period survive in many a European coun-

Fig. 5: Models of Han Dynasty (25-220 AD) wooden watchtowers from China (image: PericlesofAthens 2008, http://commons.wikimedia.org/wiki/File:Earthenware_architecture_models,_Eastern_Han_Dynasty,_3.JPG).

Fig. 6: Heddal Stave Church (image: Micha L. Rieser 2010, http://commons.wikimedia.org/wiki/File:Stavechurch-heddal.jpg).

try until today, and while there are indeed some that are rather plain, simple and quite minimalistic, many are not, but are rather complex, elaborate and partially intricately decorated.

That there is no reason to assume that Iron Age wooden architecture would have been – at least in some cases – any less developed or elaborate than any of these buildings is demonstrated by the well-known picture-postcards of late prehistoric landscapes (including houses) in form of rock carvings from the Val Camonica in Italy (fig. 7, Audouze, Büchsenschütz 1991, 83). These clearly seem to show multi-storey buildings with upper storeys protruding beyond the lower ones, or possibly balconies, and external stairs or ladders leading up to some of them, which seem more reminiscent of medieval and early modern alpine wooden farm architecture than anything we usually show in our reconstructions of Iron Age buildings. We even have clear evidence of the existence of wooden stairs in enclosed spaces considerably pre-dating the Iron Age in the form of the wooden stair recovered in the Hallstatt salt mine excavations and dated to 1344/1343 BC (Reschreiter, Kowarik 2008, 61-3), for decorated wooden grave-boards from a burial on the Dürrnberg bei Hallein (see H. Wendling, this volume), and of course for internal divisions of buildings from at least some of the houses uncovered during the excavations in the Ramsautal on the Dürrnberg bei Hallein, too (Lobisser 2005, 12-17), as well as stratigraphic evidence from at least one building in Roseldorf an der Schmida in Lower Austria for that building having been multi-storeyed (pers.comm. K. Löcker) – and this is using examples from just Austria alone.

Thus, there is not the slightest reason to assume that the confidence interval for reconstructing Iron Age houses in Europe is narrow, quite to the contrary: the confidence interval we have to assume for Iron Age wooden architecture is very wide, and includes pretty much every imaginable and technically possible possibility for elaboration. It is, at any rate, definitely much wider than what the repetitive visualisation of Iron Age buildings in reconstructions as plain, simple and minimalistic open-plan structures with no forms of elaboration whatsoever would have us believe. We have to accept that there is a distinct possibility that the confidence interval for Iron Age buildings includes the possibility for them having been multi-storeyed, possibly even with protruding upper storeys and / or balconies, having had internal divisions to create separate smaller rooms, proper stairs, perhaps even grandiose staircases, front, back and side doors, windows, dormer windows, wooden chimneys, and so on, and also the pos-

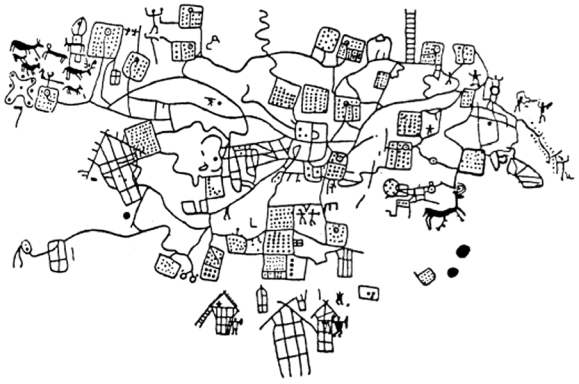

Fig. 7: Bronze and Iron Age rock carvings from Val Camonica, Italy, showing multi-storeyed houses with protruding upper storeys and external stairs/ladders (Audouze, Büchsenschütz 1991, 83).

sibility that they would have been lavishly decorated with painted or carved artwork.

It is this range, the range from the very simplistic and minimalistic open plan house with just a single floor, no or hardly any windows and the most basic roof construction put on top of them, to the very complex, multi-storeyed, extremely elaborate building whose decoration programme alone was immensely labour-intensive to create, that we must show in reconstructions of Iron Age houses to create a reliable rather than an apparently 'accurate', but in fact incredibly misleading picture of Iron Age realities. Unless we present that whole confidence interval, we're in effect misleading our audience into believing that we know for certain what 'the European Iron Age house' looked like, while in fact we don't, because there was no such thing as 'the European Iron Age house', but many different houses of very different degrees of elaboration.

Reliable reconstructions

So what, then, about 'my' house(s) as shown in fig. 4? This, then, clearly cannot be 'the Göttlesbrunn house', but only the minimalistic reconstruction which defines the lower end of the confidence interval of how that particular set of postholes might be reconstructed. To create a reliable reconstruction, illustrating the confidence interval is necessary, and to achieve this, I have created several sketches of possible reconstructions of the same set of features and combined them into one illustration (fig. 8).

By including (in this case) a sketch of the original features in the same perspective that was also used to create the various alternative reconstructions also shown (though it would, of course, be possible to include an original plan of the actual features using the same perspective as used for the reconstruction drawings instead of a sketch), the evidence upon which the reconstructions are based is included in the image – so the known known, that of which we are certain, is included for the viewer's benefit. In the centre at the top, the reconstruction I personally think is preferable for various reasons (excluded for this discussion, since they are not particularly relevant for the purpose of this paper) is given prominence: this not only clarifies for viewers what I, hopefully based on sound scholarly reasoning, consider as the most likely way the Göttlesbrunn house(s) may have looked like (or, in other words, what I think to be the most 'accurate' reconstruction) but also – should they be looking for such – provides them with an authoritative opinion to the question of 'how did that house in Göttlesbrunn most likely look like; providing a simple answer to a simple question, if you will. However, rather than stopping there (as we usually tend to do), I also included, to the bottom left and right, but at (approximately) the same scale as the central image and thus only slightly less prominent than the central image, what I consider to be reconstructions of the same building(s) at the far lower and upper end of the confidence interval: the 'minimalist' reconstruction (which is the same as on fig. 4) using Occam's Razor as the guiding principle and thus the least – only the necessary – assumptions for making houses out of postholes at the bottom left; and the 'maximalist' reconstruction, using as many assumptions for elaborating the building that I feel reasonably confident could reflect what the Göttlesbrunn house might possibly have looked like at the bottom right. In addition (just to show that we need not stop at 3 images either), I also include at the bottom center of the image and at a smaller scale, a few more possible reconstructions which fall within the range defined by the confidence interval.

With this, the reconstruction indicates to viewers not just the range of possibilities of how the Göttlesbrunn house might have actually looked like, but also clearly visualises the uncertainty inherent to the reconstructive process; if you will, I show that there are many unknown knowns in the image which can be reconstructed in many different ways. Rather than making all decisions for be-

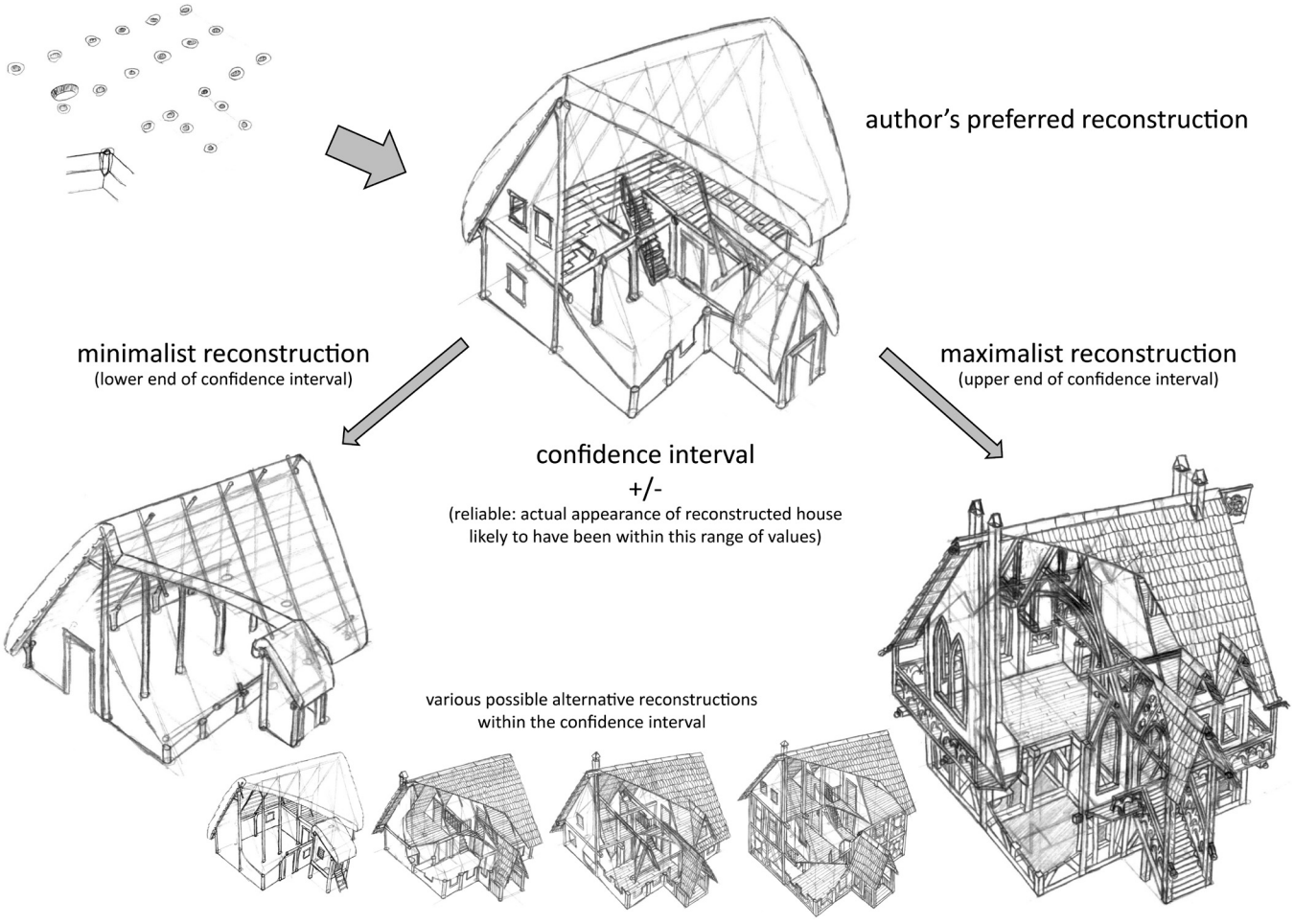

Fig. 8: A reliable reconstruction of 'the Göttlesbrunn house(s)', illustrating not just the uncertainty inherent in the reconstructive process, but also the range of possible choices.

holders, the (at least reasonably) reliable set of reconstructions invites and requires them not just to think about the process that leads from the attested fragments to the reconstructive visualisation of the 'whole' object, but also to consider, for themselves, which version they would chose as their preferred one, and for which reasons.

Of course, one needs to note that, even if we show several options of how each object we try to reconstruct might have looked like, and provide a confidence interval for each, it is still us that define the range of possible perceptions by defining – as the scholars who speak with some degree of authority – the spectrum covered by the confidence interval we decide to show. After all, in the case of the Göttlesbrunn house(s), even more fanciful reconstructions drawings than even my most elaborate option shows might well have been technically possible: for instance, I limited myself to no more than 2 full storeys and a used loft space with dormer windows, while – at least technically – a third, fourth or even more storeys would probably be possible, too. Equally, I restricted myself to the basic form of a 'standard' rectangular house, rather than putting a fanciful tower and various levels of roofing on it, like we can see it on Heddal Stave Church (fig. 6). I also restricted myself quite strongly where decoration is concerned, since I could have tried to show (even within the limits of a small sketch) much more carved and colourfully painted elements, both possibilities we cannot, with absolute certainty, exclude. And of course I to-

tally neglected the possibility that the various postholes that are the evidentiary basis for the reconstruction could be connected with each other in several other ways, too, like creating 2 6-post and one 10 post building standing in parallel to each other.

In the specific case, the main reason why I opted against all those possibilities is that it would not just have overcomplicated the point I am trying to make in this paper, but also because I do think, for various reasons, that the recorded features used as the 'inspiration' for these drawings were in fact either just one house, or at the most a house and a 4-post building standing next to it, and also were in fact a relatively modest farmhouse in an equally modest farmstead, and not something much more fanciful. Thus, the 'maximalist' reconstruction I show at the bottom right of figure 8, in my opinion, is already pushing it; is at least close to, if not already well beyond, the limit of my personal confidence in what could actually have stood at Göttlesbrunn.

In trying to provide a reliable reconstruction, restricting the confidence interval is as important as providing one in the first place: after all, when trying to provide a reliable statement, we don't just want to show what values are theoretically possible, but rather what we believe are values that are, to a greater or lesser extent, probable in the specific case we are dealing with. The range of values we want to provide when visualising uncertainty is that into which we are reasonably confident the actual value of what we are visualising will have fallen into. This restriction provides the degree of accuracy of our statements: while we do not know, and probably cannot know, whether the building(s) that stood at Göttlesbrunn looked more like the minimalistic or maximalistic reconstruction shown on figure 8, I am reasonably certain that the way the building(s) at Göttlesbrunn looked like falls within the range defined by these two limits. Thus, showing those two limits is not just a reliable, but also as accurate a statement as I can make, the values shown are as close as I believe we can get to the actual values of what once was there.

Conclusions

When trying to reconstruct an unknown 'whole' from surviving archaeological fragments, and particularly when creating visual (or indeed tangible) reconstructions, we usually face a fundamental dilemma: while we know that many elements must have been there, we often know little if anything about their actual nature. Yet in any reconstruction, particularly in visual and tangible ones, it is particularly important to fill these gaps, because that is the very point of attempting a reconstruction in the first place. This requires us to make numerous decisions in the process of creating the reconstruction, decisions that, particularly in visual and tangible reconstructions, are and have usually not been shown in the end product of the reconstructive process, the reconstruction, itself; not least because the medium of a visual image or tangible object does not allow to show uncertainty or indeed multiformity: one reconstruction image only allows to show one state of possible values, not several at once.

As of yet, when creating reconstructions, we have usually strived for maximum accuracy by producing one image and one image only, the image which shows what we believe to be the most likely way that whatever we depicted looked like. Yet, it seems to me that this not just hides the fact that in producing this image, we made many decisions which often could equally well have been made quite differently, with no particularly good reasons for why to choose the one possibility above the other, but particularly hides the fact that any such images contain a high degree of uncertainty. Thus, a false impression of certainty is created for viewers, who often do not even know that there is a high degree of uncertainty glossed over by the image, but rather take it at face value.

At the same time, to avoid the risk of being accused to have made up 'fantasy reconstructions', we scholars tend to use Occam's Razor as the guiding principle in creating such reconstructions: we try to stick to the actual evidence as closely as possible and make as few assumptions as possible when creating these images. However, this has unintended and unwanted side effects, most importantly the side effect that most our reconstructions end up looking rather minimalistic and simplistic and thus rather similar to each other. This, in turn, has the equally unintended consequence that we inadvertently create a rather uniform picture of the past we are trying to reconstruct, since each individual, equally minimalistic and simplistic reconstruction is seen by most viewers as an independent confirmation that not just each, but all reconstructed objects of similar type (e.g, houses) looked pretty much the same throughout much of prehistory. Yet, this is ac-

tually the opposite of the message that we want to send, that prehistory – even within the same narrow time period within whatever groups or divisions we have created based on whatever archaeological features or finds – is anything but uniform, but rather as diverse, messy and complicated as today's world.

Thus I argue that when we create reconstructions, we ought to aim not for an elusive and unachievable accuracy, but rather for reliability. This is best achieved by providing not just one, but several reconstructions of the same object, which serve to define a confidence interval; that is, limits defining a range of possibilities we are reasonably certain the object we are trying to reconstruct will actually have fallen into. By doing so, we not only make the uncertainties apparent that would be hidden if we were to provide just a single image, but also encourage beholders to think about the reconstructive process itself and make their own decisions about what they think is most likely.

More important than that, however, is that showing a multiplicity of different but possible reconstructions rather than just 'the one' that seems most likely to us, counteracts the false impression of the uniformity of the perceived past that results from Occam's Razor reconstructions. Particularly when seen in conjunction with each other, multiple reconstructions of each of the same type of object will increase the awareness amongst viewers of the – at least potential – multiformity of the past, and thus will be much more successful of getting the message across that we actually want audience to hear: that the European Iron Age and the people living in it were neither simple nor primitive, nor all uniform and the same, but as diverse in almost every regard as we are, if not even more so.

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